

Development of super-professional competencies of the production personnel in the context of university supplementary education programs

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Abstract. In the article, the authors explore development of super-professional competencies of the production personnel of enterprises of the military-industrial complex. Here are the most popular supplementary education programs implemented by UrFU and UrGEU and ensuring formation of professional and super-professional competencies effectiveness of which ensures competitive ability of employees and ability of enterprises themselves to switch over to the neo-industrial way of their development. Authors also suggested an express-method of assessing a quality of development of super-professional competencies of personnel in the context of universities. This method has been tested at production personnel of the enterprises of JSC EVRAZ NTMK and JSC 'Research and production corporation 'UralVagonZavod' who listened to supplementary education programs. Results that have been received confirm necessity of creation of centers of supplementary vocational education expanding implementation of spectrum of competence-based university programs for development of super-professional competencies of the production personnel of enterprises of the military-industrial complex.

1. Introduction

Development of competency-based approach to improvement of organizational and management activity of enterprises became particularly important in terms of neo-industrial evolution ensuring transition of industrial business to higher technology level of production. A special feature of such evolution is simultaneous transformation of science, scientific knowledge and discoveries into one of the main production factors by highlighting scientific knowledge, information, nonmaterial benefits in products; formation of overall scientific investigation as creative activity in production; increasing role of intellectual property; domination of incentives for personal self-fulfilment in incentives of innovative production; growing importance of knowledge and creative skills of production personnel [1]. All such changes cause increase in competitive ability of industrial enterprises by producing qualitatively new basic products based on their own innovations and techniques [2], changing attitude to quality of products [3], increasing and effective use of human resources, as well as strengthening the acceptance of new professional and super-professional competencies of production personnel of the large industrial enterprises.



2. Theoretic Aspects of Development of Super-Professional Competencies of Production Personnel of the Industrial Enterprises

Large industrial enterprise is a unique team with a great number of scientists, highly qualified engineering and technical specialists and production personnel who can work with modern process equipment participating in expansion of automation processes and forming specialized communication such as supplier–manufacturer–supplier [4]. According to A Varshavskiy, production of high technology products is characterized by use of work of specialists who have a large set of competencies in scientific, engineering-technical and production spheres which may ensure timely integration of R&D results into the production activity. Scientist believes that only engagement of personnel, who have high level professional and super-professional competencies will allow to perform evolutionary and revolutionary changes in development of technique and technology [5], i. e. will ensure competitiveness of enterprises of the industrial complex in terms of neo-industrial modernization.

Nowadays there is a great number of definitions of term ‘professional competencies’, but all of them are limited to claiming that the integration of ability and readiness of production personnel to methodically and properly structure and organize their work functions using assessment of results of their own professional practice. These competencies reflect the degree of knowledge, skills and abilities to solve professional tasks in a multivariable and timely manner within an existing specialty [6, 7].

As for super-professional competencies, they include general cultural and general scientific competencies and reflect integrative human qualities used and applied by him in different spheres of life [8]. In this regard, super-professional competencies are generally oriented to application in the professional activity, rather than in the specific specialty, thereby ensuring high efficiency and competitiveness of a person as a worker and as a professional [9]. In a modern world such competencies may include, for example, information culture, communicative culture, language proficiency, degree of discipline, ability to work with large databases, including electronic, analytic and operational thinking, creativity and leadership abilities [10, 11]. In other words, as super-professional competencies are not strictly connected with any specific profession, they may promote and effect the successful achievement in many spheres of human activity, representing a superstructure on the basic profile of personnel knowledge and skills.

Modern education system is oriented to formation of, first of all, professional competencies, which without super-professional competencies function less efficient and not effective. Only interaction of these competencies will create at the enterprise a possibility to: organize balance of technological and economic production factors; optimize timely boundaries of production and innovative processes; use maximum number of creative ideas, as well as save on expenses during the entire life cycle of product creation, including at R&D stage [12].

3. Study on the Development of Super-Professional Competencies of the Production Personnel in the Context of University Supplementary Education Programs of the Large Industrial Enterprises

The enterprises of the industrial complex are one of the basic factors of ensuring competitive ability of national economy and living standards. In turn, competitiveness of enterprises depends not only on innovative trends of development of special-purpose products, but also on efficiency of human resources management system for industry. Competencies of production personnel are formed on the basis of science and technology trends of production of defense products and specific technologies of their operation, assurance of safety of production activity, technologies of management of production chains and business processes, development of information systems and other relevant of directions of activity of enterprises, including connected with increase of potential of production of high-quality non-defense products taking into account available production capacities.

The most demanded programs at the enterprises JSC EVRAZ NTMK and JSC ‘Research and production corporation ‘UralVagonZavod’ are those that form professional and super-professional

profile: ‘Metallurgy of Ferrous Metals’; ‘Metallurgical Machines and Equipment’; ‘Industrial Thermal Power Engineering’; ‘Electric Drive Motor and Automatics of Industrial Units and Process Facilities’; ‘Chemical Engineering of Natural Energy Carriers and Carbon Materials’; ‘Metrology, Standardization and Certification’; ‘Design and Technology of Mechanical Facilities’, as well as economic programs. The number of trainees participating in all these programs has been increasing annually since 2017, see Figure 1.

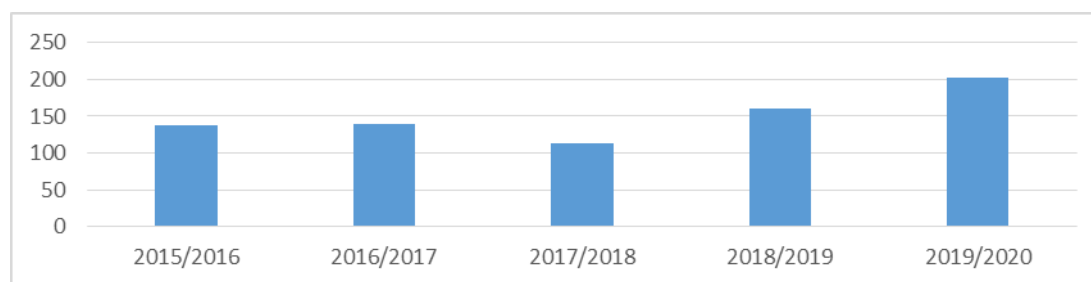


Figure 1. The number of trainees participating in supplementary education programs of JSC EVRAZ NTMK and JSC ‘Research and production corporation ‘UralVagonZavod’ from 2015 to 2020 according to data of UrFU and UrGEU.

It is necessary to note, that specific features of large industrial enterprises result in high significance of such super-professional competencies of the production personnel as operational thinking, project management, lean management, client focus, because they have a strong impact on efficiency of their professional activity, allow not only to ‘integrate’ in production structure without a long period of adaptation, but also contain current knowledge in the field of knowledge-intensive production. Nowadays super-professional competencies connected with system project management, which assumes not only degree of technical, special, economic-management knowledge, are in great demand at large industrial enterprises, because development of the project includes: formation of effective team; integration of project organizational structure into the existing linear-functional structure; development of the project decision (concept, roadmap, design and technological documentation, sketch and 3D model, financial justification, production plan, HR strategy, marketing policy), project presentation for experts. Therefore, it is necessary to provide quality and professional economic-management training in order to increase the competitive ability of specialists who have a technical university degree.

Such training is provided by UrFU and UrGEU. Features of training in economics connected with demanded content of given subjects and programs, see Table 1.

Table 1. Supplementary economic education programs of JSC EVRAZ NTMK and JSC ‘Research and production corporation ‘UralVagonZavod’ from 2018 to 2020 according to data of UrFU and UrGEU, persons.

Supplementary economic education programs	Total number of	UVZ and NTMK	Other industr. enterpr.
Accounting	17	7	10
Personnel management of organization	23	12	11
Economics and management at special-purpose product enterprises	15	8	7
Productive efforts: Current trends of payment for labour and setting of work quotas at the industrial enterprise	20	20	0
Supply-side economics	21	21	0
Total	96	68	28

Surveys of trainees participating in these programs have shown that the acquired competencies have ensured the demand of the personnel, including due to appearance of the possibility to

immediately apply in their work the acquired knowledge and abilities to solve a wide range of production problems with their help, see Table 2.

Table 2. Performance indicators of implementation of new super-professional competencies of production personnel at industrial enterprise.

Types of performance	Estimative indicator, %
Growth of demand at industrial enterprise	75
Compliance of quality of knowledge expected after training with quality of knowledge actually received	84
Part of knowledge received as a result of training expected to be applied by listeners in their work	92
Part of problems expected to be solved by listeners with the help of knowledge received	45

That is why the assessment of the compliance of quality of knowledge expected after training with quality of knowledge actually received has been recorded at 84 % from 100 % according to majority of respondents quizzed.

4. Quality Assessment of Development of Super-Professional Competencies of the Production Personnel in the Context of University Supplementary Education Programs

Quality assessment of development of super-professional competencies of the production personnel shall be performed within implemented supplementary education programs. As indicator of quality is multidimensional, then we propose to consider it in relation to the super-professional competencies in terms of some levels, see Table 3.

Table 3. Levels of quality of development of super-professional competencies of the production personnel.

Levels of quality of development of super-professional competencies	Indicator
Individual level provides for use of new knowledge in its professional activity that brings you tactile benefit and leads to transformation of your professional views	Individual_level
Collective level provides the possibility of freely sharing new knowledge and mentoring	Collective_level
Corporate level provides for significant improvement in qualifying competencies and skill, increase in production rate and reduction of number of mistakes made before	Corporate_level
Society level provides for appearance of new life values, change in way of life and formation of another understanding of economic activity	Society_level

Then quality assessment of development of super-professional competencies will be calculated according to the formula 1, which integrates specified level-based assessments.

$$Q = (Individual_level + Collective_level + Corporate_level + Society_level) / 4, \quad (1)$$

where *Individual_level* – is an assessment of individual level; *Collective_level* – is an assessment of collective level; *Corporate_level* – is an assessment of corporate level; *Society_level* – is an assessment of society level.

Assessment of each level is performed as per five-point scale by all respondents quizzed. Then final value of each level is obtained by means of calculation of average value of all scores of respondents received.

To assess quality of development of super-professional competencies by university supplementary education programs of UrFU and UrGEU, trained production personnel of JSC EVRAZ NTMK and JSC ‘Research and production corporation ‘UralVagonZavod’ were quizzed. The following scores were received:

- *Individual_level* – 4.6 points;
- *Collective_level* – 3.6 points;
- *Corporate_level* – 3.8 points;

- *Society_level* – 4.4 points.

$$Q=4.6+3.6+3.8+4.44=4.1 \text{ points}$$

Thus, it turns out that listeners of the supplementary education program working at industrial enterprises assessed the quality of formation of super-professional competencies in 4.1 points with a maximum of 5 points.

5. Conclusions

The conducted study shows the relevance and demand for formation of super-professional competencies of production personnel of large industrial enterprises. The quality of development of these minor competencies was assessed by the quizzed respondents in 4.1 points out of 5 maximum possible, which also indicates the need to expand supplementary education programs in the context of the simultaneous formation of professional and super-professional competencies, which may be achieved through the integrative interaction of universities and industrial enterprises, as part of the creation of adult education centers. Such centers will allow to use the resources of the university (license for educational activities, faculty staff, teaching and material resources, etc.) and the enterprise (material and technical facilities of the enterprise, involvement of leading specialists of the enterprise in the educational process), i. e. provide not only the synergy of theoretical and practical knowledge, but also their adaptation to the conditions of production activity of a particular enterprise, which will strengthen the competitive advantages of the industrial complex of Sverdlovsk Region.

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